

Online Real-Time Tribology Failure Detection System, Phase I

Completed Technology Project (2006 - 2007)



Project Introduction

The investigation of the coating friction as a function of time is important to monitor the ball bearing health. Despite the importance of the subject matter, there is a crucial lack of information in the literature about coating life and friction force in ball bearings as coating wear progressively increases. Here we propose to develop a strategic space vehicle health monitoring system that will identify potential and/or imminent lubrication problems, analyze these parameters in real time, and provide direct input so that these problems are mitigated prior to failure. We will set up a lab experiment environment with a universal microtribometer and acoustic emission sensors measuring the signals associated with wear and the changes that tend to occur as a function of time. Friction force and acoustic signal will be measured with respect to the bearing condition. To capture the dynamic nature of friction evolution, we propose to extract the temporal transient features from the sensing data and develop Hidden Markov Models with four distinct states associated with four operation conditions of the ball bearing. Our system uniquely combines both physics-based and stochastic models for the online diagnosis.

Primary U.S. Work Locations and Key Partners

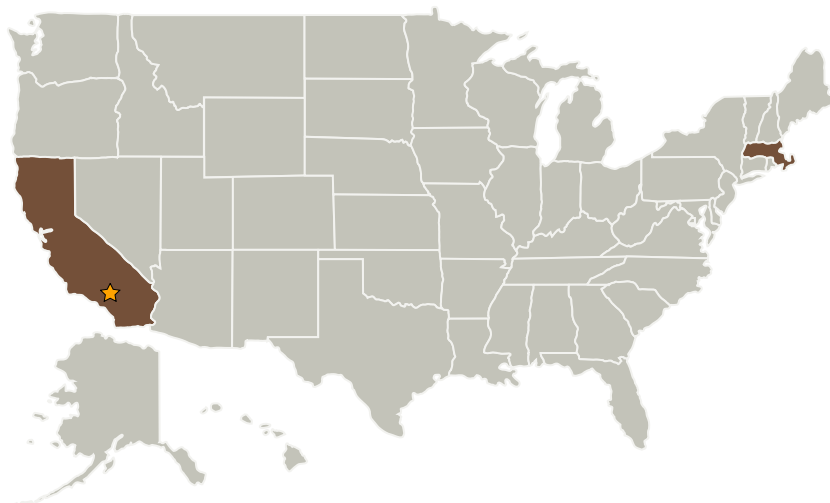
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Organizational
Responsibility**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Migma Systems, Inc.	Supporting Organization	Industry	Walpole, Massachusetts

Primary U.S. Work Locations	
California	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Bo Ling

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.3 Human Health and Performance
 - └ TX06.3.4 Contact-less / Wearable Human Health and Performance Monitoring